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Rottnest Island: The Rottnest Biological Station and Recent Scientific Research

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Foreword

The Rottnest Biological Station is an institution of which the State of Western Australia should be truly proud. To Professor H. Waring and Dr. E. P. Hodgkin of the Department of Zoology, University of Western Australia, and Dr. K. Sheard of the Division of Fisheries and Oceanography, C.S.I.R.O., belong the credit for bringing it into being. They deserve the thanks, not only of scientific workers but also of the people of the State as a whole, for their timely recognition of the need and for the enthusiasm and vigour which they brought to bear in its fulfilment.

The station was established primarily to enable research to be carried out on the marine and terrestrial fauna and flora of Rottnest Island, and for the training of undergraduate and post graduate students in essential field disciplines.

Until now all research has been directed by University personnel, with the exception of certain quokka population studies undertaken by

the Wildlife Survey Section of C.S.I.R.O. It is our desire, however, that as trained personnel become available, some part of the research programme of the Fisheries Department will be undertaken there.

I am particularly happy that as chairman of the controlling committee I am able to keep my Department in such close touch with the work as well as the progress and development of the station. In a State the size of Western Australia, with myriad scientific problems but only a small population and somewhat slender financial resources, it is of paramount importance that the most economical use be made of all available personnel and finance. The only real way of doing this is by the closest co-operation between all agencies engaged in similar kinds of research. I believe that in the Rottnest venture this desideratum is being achieved.

A. J. FRASER,
Director of Fisheries, W.A.

9.—Introduction

Broadly speaking, biological advance comes from either development of new techniques with which to attack classical problems or the exploitation of a previously inaccessible fauna using classical and other techniques. In the latter case the developments usually proceed on a well-defined pattern. The forerunners are the collectors and taxonomists who move in to catalogue and list the animals in the hitherto unknown field; this is a continuing process which broadens into ecological studies of various kinds. It is a phase of describing what there is and what occurs. Sooner or later people want to know "why?" and "how?" Then the physiologists and biochemists of various sorts take up the story.

The potential attraction of academic biological work in Australia is its rich, little explored fauna. This potential has never been fully realised, chiefly because the distances to be travelled from central laboratories to field areas are prohibitive, particularly to University staffs tied to teaching and administrative routines. The existence of a local site such as that on Rottnest Island with its attractive fauna, free from predators and protected by statute from man's destructiveness, offers a way out from this frustration if living quarters and simple laboratory facilities are available.

The various interim reports in this series show how such a station has been established and indicate the number and kind of programmes that have been set in motion on ecological and physiological themes. These reports not only concern the work that has been attempted (chiefly on the marsupial, *Setonix brachyurus*, the quokka) but outline also a number of fields where detailed work is worth while. The marine problems are little touched at present, a limitation in this regard being the absence of seawater aquaria for fish and crayfish work; so far these have been beyond our financial resources.

The choice of the quokka as a subject for intensive multipurpose research was a logical one. I had come to Australia with the express purpose of working on marsupials, but quickly realised the rarity within easy reach of the metropolitan area of the numbers of individual animals necessary for modern biological work. In this context Rottnest Island as a research area was a gift from heaven. As can be seen from these reports, its large population of quokkas provided not only a simple opportunity for introducing techniques of modern biology to students, but some very worthwhile problems in vertebrate biology. The opportunities presented by the Island for work in many other biological

fields are also evident, so that the Department of Zoology is in the happy position on the one hand of being able to cater for a wide range of specialist activities, and on the other of maintaining varied and worthwhile field courses for its students.

Students and staff have reacted to these opportunities with enthusiasm. At this point it is important to emphasize that the station and its facilities were not taken over ready-made for research workers to walk into and use as a base. Credit is given elsewhere to those who translated an idea into a site and buildings. There were many others whose enthusiasm and labour made the building usable in the early stages of the Rottneest studies. The present day student and research worker likewise helps where he can, but he should be aware that there were others before him. A list of workers contributing to Station activities (research and otherwise) is given at the end of these reports. Of these the following (in alphabetical order) were forerunners who should be doubly mentioned: J. Barker (né J. Buttle), S. Barker, George, Hodgkin, Lee, Littlejohn, Main, Malcolm (and Mrs. Malcolm), Milward, Rudeforth, Sharman, Shield, and P. Woolley.

The form of these reports has been dictated by the necessity of fitting a large amount of different kinds of information into the one small Journal part. Accordingly all references concerning Rottneest Island have been collected in a separate Bibliography and only those outside this scope, but necessary to a particular report, have been included with that report. Also, information with regard to individuals named in these reports has been given separately. There has been some duplication but only where this is necessary for clarity. Perhaps some helpers may have been overlooked in the rush of preparation. If so I tender my apologies in advance.

In conclusion I would like to offer my personal thanks to all who have co-operated in this most rewarding venture. Elsewhere the financial contributions of the University, State Fisheries, and Australian Academy of Science are acknowledged. It is pleasing to me personally to here acknowledge the moral support and generous financial backing of the C.S.I.R.O. Executive in the carrying out of our marsupial research programme.

H. WARING,
Professor of Zoology.

10.—Rottneest Island as a Location for Biological Studies

The choice of Rottneest Island as a research centre arises from certain obvious advantages, e.g., the ease of access and the abundance of the quokka, the marsupial around which so much of the research has centred. The titles of the accompanying papers could suggest that there is nothing further to be said on the problems inherent in an insular situation. This may be so, yet, as will be mentioned below, the solutions of problems attacked on Rottneest have a potential application to continental situations which would not usually be considered as having anything in common with an island fauna. It thus seems desirable to give the general background and aspirations of the research a little more discursive treatment than will be given in other papers of this series in order that the full implications of the work can be appreciated.

Even a superficial acquaintance with the terrestrial fauna of the western portion of Australia poses a number of problems all of which centre around the distribution of animal species at the present, during the historical, the pre-historical and geological past. Many of the extant terrestrial animals especially the mammals have disjunct or restricted distributions which give every impression of being relicts of wider ranges. Perusal of the records of occurrence in the historical past confirm their relict nature for one soon discovers not only the wide extent of the former range but also the number of species which have become entirely extinct. Commonly such range restriction and extinction are ascribed to habitat destruction following the advent of European-type culture in Australia as well as the impact of introduced predators such as foxes or herbivores such as rabbits. However, this cannot be the whole story for some

species of mammals apparently became extinct before settlement was extensive and certainly before foxes and rabbits were present. The suspicion that European man with his associates was not the sole agent of extinction is strengthened when one studies the cave deposits along the Western Australian littoral. Here, in extensive deposits (mostly originating from owl pellets though there are many remains of larger animals), are an immense number of specimens of species which are either no longer found in the vicinity or are entirely extinct.

Glauert was (1910, 1912, 1914, 1948) the first to work these deposits and more recently Lundelius has surveyed caves over a much wider geographical area and, although this latter worker has as yet published no C14 dates, there is every indication that faunal changes have proceeded throughout the deposits to the superficial zone and these must be considered as within historical times. Many of the bones collected by Glauert and Lundelius (1957) are con-specific with species now restricted to the wetter south-east of Australia. The pre-historical and geological evidence thus suggests that environmental factors, as opposed to man-made habitat changes, have perhaps played an important part in the range reductions and extinctions witnessed in the past 100 years or so.

Students of climatic change have proposed this mechanism repeatedly to account for disjunct or relict distributions in the Australian fauna. Some workers suggest a great aridity at about 5,000 years ago while others disagree and Tindale points out that because of the uniqueness and sensitivity of some relict populations the climate could not have been much more arid.